

ABSTRACT

The present invention provides a membrane-electrode structure having an adhesive support layer that does not peel off the solid polymer electrolyte membrane in a high-temperature high-humidity environment during the operation of a fuel cell, and a producing method thereof. The present invention also provides a polymer electrolyte fuel cell that uses the membrane-electrode structure, and an electric apparatus and a transport apparatus that use the polymer electrolyte fuel cell. The solid polymer electrolyte membrane 2 is sandwiched by catalyst layers 3 and 4 positioned in the inner circumferential side thereof, and one face is coated with the catalyst layers 3 and 4 and the adhesive support layer 9. The adhesive support layer 9 is formed of an adhesive that has fluorine atoms in the molecular structure. The adhesive has a tensile elongation at break of 150% or more after curing. Having porous diffusion layers 5 and 6 that coat the catalyst layers 3, 4 and the adhesive support layer 9, the adhesive support layer 9 is integrated with the diffusion layer 6 through adhesive permeating layers 10. Irregularity that has a maximum height R_{\max} of surface roughness within a range between 3 and 20 μm is formed on the area coated by the adhesive support layer 9 of the solid polymer electrolyte membrane 2, and the adhesive support layer 9 is bonded to the area where the irregularity has been formed by pressing under heating.